

6C: Marine Biological Communities

Questions & Answers

Q: When you say contaminated, do you mean chemically contaminated sediments at a site?

Eaton: The test sites that we've been using to develop these biocriteria have had moderate to high levels of chemical contamination.

Q: What, besides presence or absence in an urban waterway justifies the assignment of sensitive vs. non-sensitive?

Eaton: Well, I guess "sensitive" has been defined by all of the sampling that has been conducted in contaminated environments over the last 18 years. So from all of the trawling that we've done in Superfund sites, fish species or categories of fish species that we encounter there with some regularity are obviously tolerant species or they wouldn't be present. And then species that, from reference areas of matched depth and sediment grain size and salinity, are present in much reduced numbers in the contaminated sites, we define them as being sensitive. But if a species is found in equal numbers or relatively equal numbers from the contaminated site compared to a reference site, we also would label that as a tolerant species.

Q: I guess, Charlie, continue on that. How do you know, in many of the same Superfund sites, there is a very large loss of preferred habitat. How do you know it isn't synergistic with that, or coincidental with loss of habitat vs. the contamination?

Eaton: Of course, it depends on which biological assemblage you're looking at. Each biological assemblage is looking at a different scale, or sampling a different scale. So the demersal fish populations, of course, are the largest scale, and the epibenthos is less mobile, a slightly smaller scale, and then the infauna would be the smallest scale of all. But you're right. For instance, in our initial phase in one comparison, we compared the Hylebos Waterway and the Blair Waterway, both of which don't have really natural, are not natural areas with, for instance, a natural tidal zone. There's a few in the Hylebos Waterway, a few little intertidal tiers, but not much. And that was probably one of the major problems with our choice of Quartermaster Harbor, comparing it to Thea Foss Waterway in phase two. I've lowered the priority of those metrics because of the fact that even though the physical parameters are well in line in September and late summer, if you did continuous monitoring of the physical parameters, Quartermaster Harbor would probably come out to be a different class than would be represented by one of the waterways. So it's probably better to compare a cleaner waterway to a dirtier waterway, rather than to a clean one, which is what we did in phase three.

Q: How many organisms were considered pollution tolerant? And the second question is, regarding the ecology of the communities you sampled, do you see communities that are more susceptible, more tolerant to change, as opposed to long-lived communities that, they usually call them type-three colonies, that take a long time to establish and are not used to disturbance?

Laetz: The first question, I looked into that, specifically one critter that's been widely used, *Capitella capitata*, a little polychaete worm. It was recovered in very low numbers and usually not at all in all of those samples. Conversely, there were some pollution-sensitive species, namely ophiuroids, brittle stars, that were collected at each station, which is a positive. The second question was about the type of communities that were found. A lot of the numerically dominant organisms were considered opportunistic species. But there were also some species present in relatively high numbers, although they weren't a dominant, such as *Lumbrineris*, it's a polychaete worm that is considered relatively long lived,

an indicator of a more stable community. But the numerically dominant ones were mostly opportunistic species.

Sutherland: [A poorly recorded response to an unrecorded question:] David Swindlakes did his thesis in that area, and he showed how they actually changed the topography of the tideflat. You can see the burrow openings in the mid-intertidal ... a smaller size fraction of macrofauna, but they burrow up to 50 centimeters and our core depths were only up to 10 centimeters. But that might be something to look at in the future: if they alter eelgrass or how eelgrass alters their environment.

Q: Did you do any correlation between elevation in the intertidal and other factors.

Sutherland: Yes, we looked at changes in sediment grain size and bulk density and water content along the tidal height. But what I tried to do was eliminate tidal factors in each of the transects by going across at the same tidal height. But we haven't yet done along shore or perpendicular to shore comparisons yet.

Q: Were mussels on the eelgrass or on the substrate?

Sutherland: Actually these mussels were collected from cores that were sieved. I'd say they were either within the sediment or on the surface. We haven't been examining the epifauna on the eelgrass. That's been done by other people, though.

Q: Did you get any fish in your beach seine samples? Did you see any juvenile rockfish or any other species?

Houghton: No juvenile rockfish. There were lots of juvenile flatfish, starry flounder, English sole, sand sole, lots of *Leptocottus*, of course. But the most dominant and most abundant, and we only did beach seining during the juvenile salmon out-migration, but we did catch tremendous numbers of very small surf smelt, so they really liked that in there.

Q: What was the total acreage of that marsh? And also, can you give kind of a ballpark of the costs associated with creating something like that?

Houghton: As far as the area within the lagoon of salt marsh plantings, I think we planted in the second year approximately a third of an acre. Then, as far as the cost goes, the monitoring costs have been, considering the baseline costs through the five-year post-construction monitoring, were \$100,000-120,000, which the port paid. On the other hand, to take that material and dump it in deep water at the disposal site would have cost them at least that much because we used 300,000 yards of material that DNR would have charged us 50 cents a year to take to open-water disposal. So really, it was the classic win/win, I think.

Q: How did you keep the geese off the section that you planted?

Houghton: Well, we planted a little bit later. We did actually put up flashing red and silver tape and that may have helped. We also used more plugs the second time, because with the little shoots in that real soft mud the first year, they just grabbed a hold of it and yanked it out. But with the plugs, they could nibble at the top, but they couldn't actually destroy the plug. They would get some.

Q: We find geese predation for all the urban estuaries where you do restoration is one of the tough factors.

Houghton: Special hunting seasons would work.

